

WHAT IS CLAIMED IS:

1. A printing press for printing a color chart including a plurality of color chart fields in a margin of printing paper, said printing press equipped with a color chart measuring apparatus for reading each of said color chart fields on said printing paper to

5 measure color chart information,

said printing press comprising:

a transport section for transporting said printing paper;

an imaging section for capturing an image on said printing paper transported by said transport section;

10 a reading time setting section for determining, in accordance with a transport operation of said printing paper, a reading time during which said imaging section reads an image of said color chart;

an image data storage section for storing image data on an area read by said imaging section during said reading time, as readout image data;

15 a color chart actual position calculation section for calculating an actual position in which each of said color chart fields was actually printed, on the basis of said readout image data; and

a color chart information determination section for determining color chart information about each of said color chart fields from said readout image data
20 corresponding to said actual position.

2. The printing press according to claim 1, further comprising:

a printing plate recording section for positioning and recording said color chart on a printing plate,

25 wherein said reading time setting section determines said reading time on the

basis of a position in which said color chart was recorded.

3. The printing press according to claim 2, further comprising:

5 a color chart data adding section for adding color chart data representing said color chart to print image data representing printing matter; and

a color chart position computation section for computing a position to which said color chart data was added, on the basis of an image size given by said print image data,

10 wherein said reading time setting section determines said reading time on the basis of said position to which said color chart data was added.

4. The printing press according to claim 1, further comprising:

a plate cylinder for holding a printing plate;

15 a blanket cylinder with a blanket surface for receiving an ink image from said plate cylinder;

an impression cylinder for holding printing paper and receiving an ink image from said blanket cylinder; and

an encoder for detecting a rotational position of at least any one of said impression cylinder, said plate cylinder, and said blanket cylinder,

20 wherein said reading time setting section determines said reading time on the basis of a detection signal from said encoder.

5. The printing press according to claim 4, wherein

25 said plate cylinder and said blanket cylinder are double-diameter cylinders each having two print areas, and

said impression cylinder is an n -fold diameter cylinder having a $n/2$ -fold diameter of said plate cylinder (where n is a natural number),

said printing press feeding and delivering said printing paper for every two turns of said impression cylinder,

5 said printing press further comprising:

a paper feed/delivery signal setting section for setting a paper feed/delivery signal that indicates whether or not to feed/deliver said printing paper for each rotation of said impression cylinder, wherein

said encoder detects a rotational position of said impression cylinder, and

10 said reading time setting section determines said reading time by determining from said paper feed/delivery signal a time when said printing paper passes under said imaging section and determining from said detection signal from said encoder a position of said printing paper being transported.

15 6. The printing press according to claim 5, wherein

said paper feed/delivery signal setting section is a sheet sensor for detecting said printing paper.

7. The printing press according to claim 1, wherein

20 said color chart includes one or more reference marks to specify the position of said color chart,

said color chart actual position calculation section calculates said actual position of each of said color chart fields, on the basis of both a position of said reference mark detected according to said readout image data and previously-stored position
25 information about relative positions of said reference mark and each of said color chart

fields.

8. The printing press according to claim 7, wherein

said imaging section includes two line sensors arranged along a direction of
5 print span, each sensor being capable of reading an area on said color chart,

said areas to be read by both of said line sensors overlapping each other, and

at least one of said reference marks is a common reference mark which is
positioned in an overlapping portion of said areas to be read by both of said line sensors
and is used in common for reading of said areas.

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9. The printing press according to claim 8, wherein

said image data storage section includes two memories for individually storing
two readout image data obtained by said two line sensors, each of said two readout image
data being stored in a corresponding one of said memories from the other side of said
15 common reference mark.

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10. A printing press for printing a color chart having a plurality of color chart
fields in a margin of printing paper, said printing press equipped with a color chart
measuring apparatus for reading each of said color chart fields on said printing paper to
20 measure color chart information,

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said printing press comprising:

a measuring area setting section for determining an area in which said color
chart is located on said printing paper as a measuring area;

a paper stack section for stacking said printing paper printed;

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a rough positioning section for roughly positioning said printing paper stacked

in said paper stack section;

an imaging section for reading an image on said printing paper;

an image data storage section for storing, out of readout image data obtained by said imaging section, at least readout image data on an area determined by said measuring
5 area setting section;

a color chart actual position calculation section for calculating an actual position of each of said color chart fields on the basis of said readout image data; and

a color chart information determination section for determining said color chart information about each of said color chart fields from said readout image data
10 corresponding to said actual position.

11. The printing press according to claim 10, further comprising:

a printing plate recording section for positioning and recording said color chart on a printing plate,

15 wherein said measuring area setting section determines said measuring area on the basis of a position in which said color chart was recorded.

12. The printing press according to claim 11, further comprising:

a color chart data adding section for adding color chart data representing said
20 color chart to print image data representing printing matter; and

a color chart position computation section for computing a position to which said color chart data was added according to an image size given by said print image data,
wherein said measuring area setting section determines said measuring area on the basis of said position to which said color chart data was added.

13. A printing press for doing printing using a printing plate on which an image is recorded, said printing press comprising:

a color chart data storage section for storing color chart data representing a color chart;

5 a color chart data adding section for adding said color chart data to print image data;

a printing plate recording section for recording said image on said printing plate on the basis of said print image data obtained by the addition of said color chart data;

10 a color chart position computation section for computing a position to which said color chart data was added;

a printing section for printing a print image and said color chart on printing paper by using said printing plate;

15 an image data acquisition section for acquiring image data on an area including said color chart on said printing paper on the basis of said position to which said color chart data was added; and

a color chart information determination section for determining color chart information about each of color chart fields in said color chart on the basis of said image data.

20 14. A color chart measuring apparatus for capturing an image on printing paper on which a color chart having a plurality of color chart fields was printed and measuring color chart information,

said measuring apparatus comprising:

25 an imaging section for reading an image on said printing paper being transported;

a reading time setting section for determining, in accordance with a transport operation of said printing paper, a reading time during which said imaging section reads an image of said color chart;

an image data storage section for storing image data on an area read by said
5 imaging section during said reading time, as readout image data;

a color chart actual position calculation section for calculating an actual position in which each of said color chart fields was actually printed, on the basis of said readout image data; and

a color chart information determination section for determining said color chart
10 information about each of said color chart fields from said readout image data corresponding to said actual position.

15. The color chart measuring apparatus according to claim 14, wherein

said reading time setting section acquires position information about said color
15 chart from an image recording apparatus for recording said color chart on a printing plate, and determines said reading time on the basis of said position information.

16. A color chart measuring method for use in a printing process for recording a
print image and a color chart having a plurality of color chart fields on a printing plate
20 and printing said color chart in a margin of printing paper by using said printing plate,

said measuring method comprising the steps of:

computing a position of said color chart relative to said print image;

determining an area to capture an image of said color chart on the basis of said
position of said color chart;

25 imaging said area on said printing paper;

storing readout image data obtained through imaging;
computing an actual position of each of said color chart fields from said readout
image data; and
determining color chart information on the basis of said readout image data
5 corresponding to said actual position.

17. A color chart measuring method for use in a printing process for recording a
print image and a color chart having a plurality of color chart fields on a printing plate
and printing said color chart in a margin of said printing paper by using said printing
10 plate,

said measuring method comprising the steps of:
computing a position of said color chart relative to said print image;
capturing an image on said printing plate;
determining an area in which said color chart is located, on the basis of said
15 position of said color chart;
out of readout image data obtained through imaging, specifying readout image
data on said area in which said color chart is located;
computing an actual position of each of said color chart fields on the basis of
said specified readout image data; and
20 determining color chart information from said readout image data
corresponding to said actual position.

18. The printing press according to claim 1, wherein
said color chart is provided along a width of said printing paper for checking at
25 least an ink density in said printing press,

said color chart includes:

at least two reference marks located at a predetermined distance from each other in a direction of a print span; and

a plurality of kinds of color chart fields provided in a line between said
5 reference marks,

wherein said reference marks have a pattern to indicate positions of said color chart fields with respect to a print direction.

19. A color chart measuring method for capturing an image of a color chart
10 having a plurality of color chart fields on printing paper and measuring color chart information on the basis of image data obtained through imaging, wherein

color data corresponding to each of said color chart fields is computed from image data on each of said color chart fields, and white color data corresponding to each of said color chart fields is computed from image data on an unprinted area in the close
15 vicinity of each of said color chart fields; and

in determining said color chart information on the basis of said image data on each of said color chart fields, a correction is made to said color data on each of said color chart fields on the basis of corresponding one of said white color data.

20 20. The color chart measuring method according to claim 19, wherein imaging of said color chart is carried out while said printing paper is being transported.

21. The color chart measuring method according to claim 20, wherein
25 imaging of said color chart is carried out by means of an imaging section

including a plurality of imaging devices, and

said imaging section reads a white reference object which was positioned at a standstill before the imaging of said color chart and uses said white reference object to make a shading correction on said image data.

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22. The color chart measuring method according to claim 19, wherein

a color density D for each of said color chart fields is found from $D = -k \times \log(c1/c0)$, where $c1$ is color data on each of said color chart fields, $c0$ is white color data on a corresponding unprinted area, and k is a gain coefficient.

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23. A color chart measuring apparatus installed in a printing press for doing multicolor printing on printing paper, said measuring apparatus capturing an image of a color chart having a plurality of color chart fields on said printing paper and measuring color chart information on the basis of image data obtained through imaging,

15 said measuring apparatus comprising:

an imaging section for reading an image including said color chart and an unprinted area in the close vicinity of said color chart on said printing paper being transported;

a computation section for computing color data on each of said color chart
20 fields and white color data on an unprinted area in the vicinity of each of said color chart fields from said image data obtained through imaging by said imaging section; and

a white color correction section for correcting said color data using corresponding one of white color data.

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24. A color chart provided along a width of printing paper for checking at least

an ink density in a printing press,

said color chart including:

at least two reference marks provided at a predetermined distance from each other in a direction of a print span; and

5 a plurality of kinds of color chart fields arranged in line between said reference marks,

wherein said reference marks each have a pattern to indicate positions of said color chart fields with respect to a print direction.

10 25. The color chart according to claim 24, wherein
an unprinted area is formed adjacent to said color chart fields on said printing paper, and

said reference marks each further has a pattern to indicate a range of said unprinted area.

15 26. The color chart according to claim 24, wherein
of said at least two reference marks, two reference marks are provided at about both ends of said printing paper across the width of said printing paper.

20 27. The color chart according to claim 24, wherein
some of said plurality of kinds of color chart fields are arranged on both sides of any one of said at least two reference marks in symmetry with respect to a point about said any one reference mark.

25 28. The color chart according to claim 24, wherein

said color chart fields are of multiple colors (YMCK), and
said reference marks are of a single black (K) color.

29. A color chart measuring method for measuring the color chart of claim 24,
5 comprising the steps of:

obtaining image data by imaging an area including said color chart on said
printing paper;

computing positions of said reference marks from said image data;

10 computing a position of each of said color chart fields on the basis of said
positions of said reference marks; and

measuring each of said color chart fields on the basis of said position of each of
said color chart fields,

wherein a tilt of said image data obtained by reading said color chart is
corrected on the basis of said positions of said at least two reference marks.

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30. The color chart measuring method according to claim 29, wherein

imaging of said printing paper being transported is carried out by means of at
least one line sensor located along a width of said printing paper.

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31. The color chart measuring method according to claim 30, wherein

when said color chart includes three or more reference marks, imaging is
carried out by using a different line sensor for every two adjacent reference marks out of
said three or more reference marks.